



Energy Vision AX Dashboard

User Guide

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1. About EnergyVision

The EnergyVision AX Dashboard is a light-weight energy display dashboard, and a simple tool for energy benchmarking and analysis, built on Niagara web graphics technology. It runs on any Niagara AX platform including a PC-based supervisor or JACE controller requiring no additional plugins.

As well as providing an energy dashboard display for use in a building reception area, EnergyVision is the ideal system to help manage energy, analyse and optimise the operation of your facility and to measure performance across multiple levels within your building or estate. Using advanced tools to gather and aggregate data from energy and utility meters, along with graphically rich visualisation techniques, dynamic menus, and charts, dials and gauges.

2. Features

EnergyVision provides the following features and benefits:

- Visually stunning graphs, meters, and dials to create a fantastic user experience.
- Kiosk Mode shows a rotating sequence of energy dashboard pages ideal for use in a building foyer or reception area.
- Dynamic hover-over menu system creating powerful navigation between zones or pages.
- Energy Benchmarking graphs, with weekly, monthly, yearly view – for example comparing this week, last week and this week last year.
- Aggregation of meter data with the ability to compare energy profiles for different zones, buildings or time periods.
- Intelligent metering components with normalization of data, handling meter roll-over and periods of missing data.
- Visualisation and ranking of consumption between meters, zones, systems, buildings, sites etc.
- Attractively simple license model – one price, for one installation, with the ability to scale up to the size you need with no on-going or hidden charges.

3. Licensing

3.1. License Requirements

To use the EnergyVision AX Dashboard, you must have a target NiagaraAX host (JACE or Supervisor) that is licensed with the “Forest Rock License” file. An energyVision license can be obtained from your local distributor or directly from Forest Rock Systems:

Phone: +44 (0)845 5197958

Email: licensing@forestrock.co.uk

The EnergyVision License is installed in the same way as any Niagara driver. It is recommended that the station and workbench be restarted after installing a licence.

3.2. Software Installation

From your PC, use the Niagara Workbench 3.7.xx or higher. Copy the energyVision.jar file to the modules directory folder where your Niagara workbench software is installed; restart your PC or platform services to complete the installation. It is recommended that the EnergyVisionDemo station included with the EnergyVision software is copied into your Niagara/stations folder as this provides a simple starting point to creating and customising your EnergyVision dashboard.

4. EnergyVision Palette

Once the EnergyVision module, license files, and certificates have been installed in the host system, you are ready to start building your EnergyVision dashboard. A workbench palette called “energyVision” gives access to the various components which make up the system. The Palette can be reached using the Palette side bar (in the Window menu, choose Sidebars->Palette to show the palette view). Click on the Open Palette button and search for the “energyVision” palette.

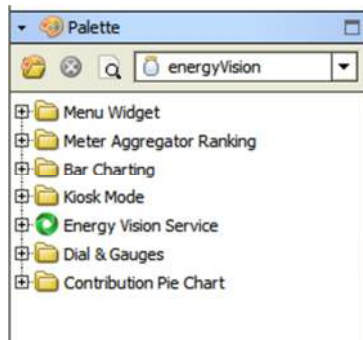


Figure 1 - Energy Vision palette overview

The palette side bar has a preview button which can be used to see a sample view of each of the dials.

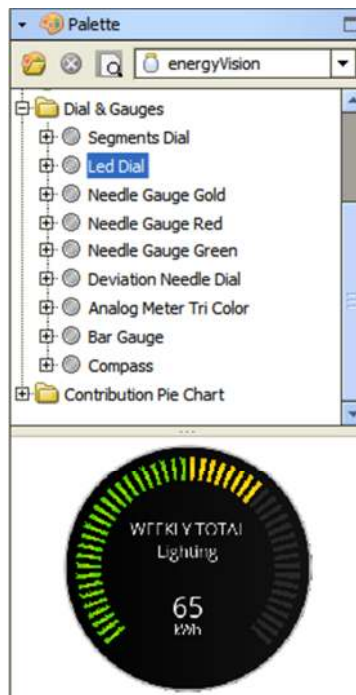


Figure 2 - Preview of Energy Vision Widgets within the palette sidebar

5. EnergyVision Components

The EnergyVision module contains a number of key components to manipulate and organise utility and energy metered data, as well as a collection of graphical widgets to visualise and compare energy consumption and trends.

Each component is described in detail as follows:

5.1. EnergyVision Service

The EnergyVision service can be added to a new station by dragging an instance of EnergyVision service from the palette into the **services** folder of a Niagara station.

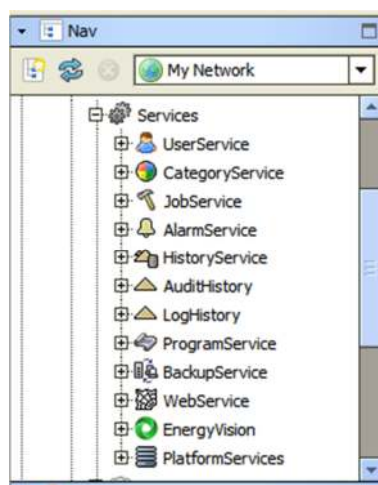


Figure 3 - Adding EnergyVision Service under the station's Services container

The EnergyVision Service contains Managers to license a particular EnergyVision instance, and to provide cost conversions of consumption, benchmarking and comparison data.

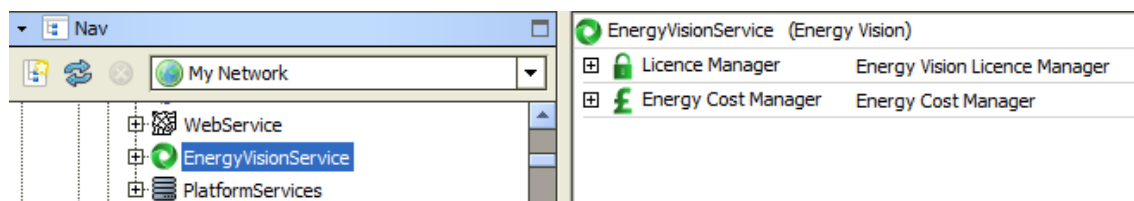



Figure 4 - Property sheet of the EnergyVision service

Features

The EnergyVision service consists of two Managers:

1. **License Manager** – this part of the Service Handles licence validation for the product. Once the energy vision service has been added into to the services of the host station, and the required licence and certificates are present, the licence will be validated and the **licence active** and **energy vision active** properties will become set to true.
The **Active features** property provides information about the type of licence installed.

 **License Manager** (Energy Vision License Manager)






<input type="checkbox"/>  Licence Active	<input type="text" value="false"/>
<input type="checkbox"/>  Energy Vision Active	<input type="text" value="false"/>
<input type="checkbox"/>  Licence Status	<input type="text" value="Not Licensed"/>
<input type="checkbox"/>  Active Features	<input type="text" value=""/>

Figure 5 - Property sheet of the License Manger under the EnergyVision service

2. **Energy Cost Manager** – this serves cost/consumption information for other components where consumption or comparison data is to be displayed as the cost of the energy or resource consumed. The Default values are zero giving a consumption/cost ratio of 1-1.

 **Energy Cost Manager** (Energy Cost Manager)
















<input type="checkbox"/>  Gas Consumption	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Gas Cost	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Gas Cost Per Unit	<input type="text" value="1.00"/>	
<input type="checkbox"/>  Water Consumption	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Water Cost	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Water Cost Per Unit	<input type="text" value="1.00"/>	
<input type="checkbox"/>  Power Consumption	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Power Cost	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Power Cost Per Unit	<input type="text" value="1.00"/>	
<input type="checkbox"/>  Other Fuel1 Consumption	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Other Fuel1 Cost	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Other Fuel1 Cost Per Unit	<input type="text" value="1.00"/>	
<input type="checkbox"/>  Other Fuel2 Consumption	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Other Fuel2 Cost	<input type="text" value="1.00"/>	[0.00 - 1.797693134862316E308]
<input type="checkbox"/>  Other Fuel2 Cost Per Unit	<input type="text" value="1.00"/>	

Figure 6 - Property Sheet of the Energy Cost Manger under the EnergyVision Service

To incorporate approximate resource costs for use in charts and dials, the properties of the cost manager should be set according to the approximate unit costs for each type of fuel or utility.

The cost manager provides only indicative costs and doesn't account for different tariffs. It is intended to provide an estimated cost, and cannot be used for bill verification or tenant billing applications.

To set the cost for a particular type of fuel, enter an amount of fuel, and the total cost for that amount of fuel. The intention here is to take the cost and number of units consumed from a recent utility bill for a particular site. The Cost manager will then calculate the Cost per Unit for that particular resource. Each of the gauges and charting components can be configured to present their data using this cost per unit, rather than displaying the raw unit costs.

5.2. Pop-out Menu

Pop-out Menu also called as Dynamic Menu is a 3 Level configurable Hover Menu for Px pages. The Pop-out Menu can be directly added on to the Px page from the EnergyVision palette. Fig 5.2.1 shows the default view of the Dynamic Menu which has to be selected when adding a new Pop-out or Dynamic Menu.

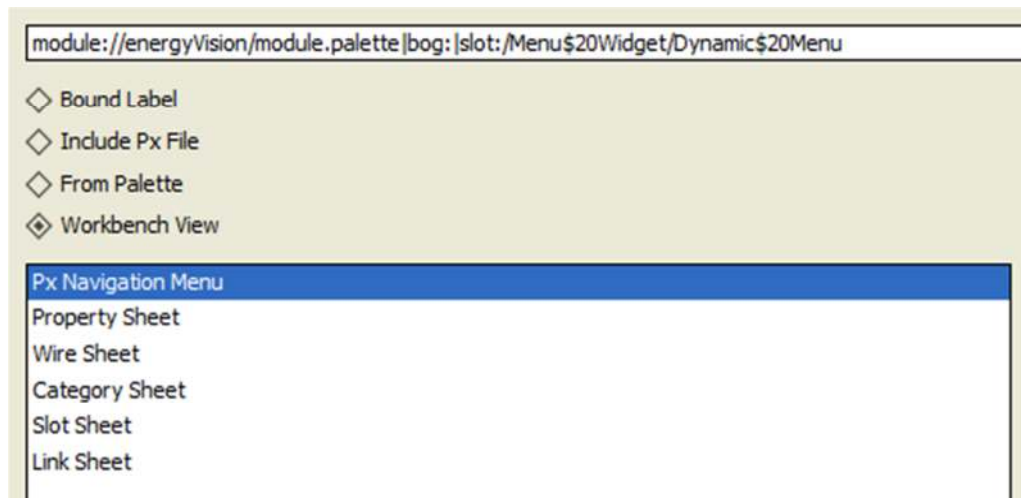


Figure 7 - Adding Pop-out Menu from palette

Each element on the menu can be configured as a hyperlink to an **Ord** or configured to serve as a pop out menu for sub elements. The Pop-out menu uses an easily configurable XML file to get the following properties related to the Menu:

- Structure of the Menu.
- Display Texts for each of the menu and the submenu items.
- Available Hyperlink ords for menu and submenu items.

User defined XML files can be created as per user requirements using the following section which explains the structure of the XML used within the Dynamic Pop-out Menu.

Typical XML Structure for Menu

A typical menu structure in the XML file can be similar to the structure as in Figure 8 and can be changed as per requirements. As in the screenshot of the example XML file, the XML structure directly resembles the structure of the Pop-out Menu. The menu can be structured as a single level structure to a maximum of 3 level structures. The top level menu items are defined as **mainMenuLink**, second level under this is named as **subMenuLink** and the third and final level of the menu structure is defined as **subSubMenuLink**. Each of these menu items has two main properties which are the **displayText** and the **ord** for hyperlinking. If the ord on the menu item is removed and has sub menu items then it is treated as another pop-out menu item without hyperlink.

```
<?xml version="1.0"?>
<nav>
  <mainMenuLink>
    <displayText>HOME</displayText>
    <ord>fox:|station:|slot:/Home</ord>
  </mainMenuLink>

  <mainMenuLink>
    <displayText>ENERGY RANKING</displayText>
    <ord>fox:|station:|slot:/Energy$20Ranking</ord>
  </mainMenuLink>

  <mainMenuLink>
    <displayText>ENERGY BENCHMARKING</displayText>
    <subMenuLink>
      <displayText>CAMPUS</displayText>
      <ord>fox:|station:|slot:/Energy$20Benchmarking</ord>
    </subMenuLink>
    <subMenuLink>
      <displayText>LIBRARY</displayText>
      <ord>fox:|station:|slot:/Energy$20Benchmarking/Energy$20Benchmarking$20Library</ord>
    </subMenuLink>
    <subMenuLink>
      <displayText>SPORTS HALL</displayText>
      <ord>fox:|station:|slot:/Energy$20Benchmarking/Energy$20Benchmarking$20Sports$20Hall</ord>
    </subMenuLink>
    <subMenuLink>
      <displayText>TEACHING BLOCK</displayText>
      <ord>fox:|station:|slot:/Energy$20Benchmarking/Energy$20Benchmarking$20Teaching$20Block</ord>
    </subMenuLink>
  </mainMenuLink>

  <mainMenuLink>
    <displayText>ENERGY CONSUMPTION</displayText>
    <ord>fox:|station:|slot:/Energy$20Consumption</ord>
  </mainMenuLink>

  <mainMenuLink>
    <displayText>ENERGY CONTRIBUTION</displayText>
    <subMenuLink>
      <displayText>CAMPUS</displayText>
      <ord>fox:|station:|slot:/Energy$20Contribution</ord>
    </subMenuLink>
    <subMenuLink>
      <displayText>TEACHING BLOCK</displayText>
      <ord>fox:|station:|slot:/Energy$20Contribution/TeachingBlock</ord>
    </subMenuLink>
  </mainMenuLink>

  <mainMenuLink>
    <displayText>KIOSK MODE</displayText>
    <ord>fox:|station:|slot:/Kiosk$20Mode</ord>
  </mainMenuLink>
</nav>
```

Figure 8 - Typical XML Structure for Pop-out Menu

Configuring the Pop-out Menu

After adding a new Pop-out Menu on the Px page and creating a required XML file which provides the required structure for the custom menu, double click on the Pop-out Menu to bring up the properties, as in Figure 9. Change the **configPath** property which refers to the XML file for the Menu structure. The path can be changed to refer to the user defined XML file for a custom Menu Structure. Subsequently the font styles, background colour, foreground colour, hover colour etc. can be changed as per user

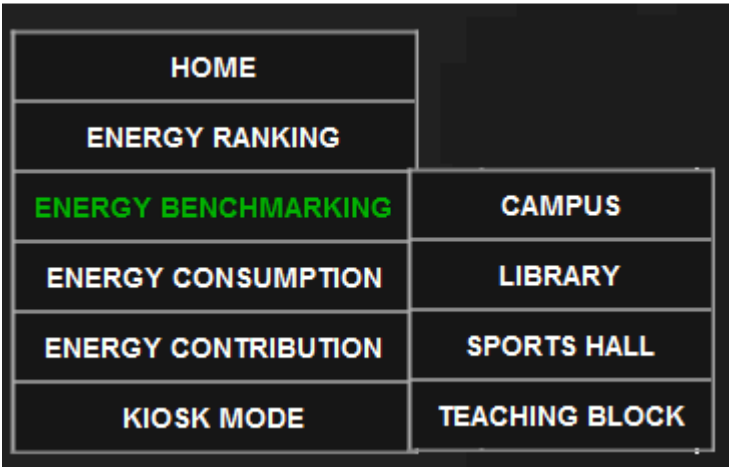
requirement. Figure 9 also gives an example of the properties which are changed to suit the EnergyVisionDemo station's Pop-out Menu.

PxNavigationMenu		
configPath	file: ^xml/Menu.xml	...
debug		
enabled	true	▼
horizontalBarColor	#898989	▼
horizontalBarWidth	2.00	
layer	Menu	▼
layout	30.0,80.0,250.0,220.0	...
menuBackgroundColor	#161616	▼
menuFont	bold 14.0pt Arial	...
menuFontTextColor	white	▼
menuFontTextHoverColor	#02b202	▼
menuHoverBackgroundColor	#161616	▼
menuLayout	30.0,80.0,250.0,220.0	...
menuLinkHeight	33.00	
menuLinkWidth	200.00	
menuSeparatorBackgroundColor		...
menuSeparatorHeight	2.00	
menuSeparatorLineColor		...
menuSeparatorLineStartX	25.00	
menuSeparatorLineStartY	7.00	
menuSeparatorLineWidth	125.00	
menuSeparatorWidth	200.00	
subMenuLayout	30.0,80.0,360.0,360.0	...
subMenusBackgroundColor	#161616	▼
subMenusFont	bold 14.0pt Arial	...
subMenusFontTextColor	white	▼
subMenusFontTextHoverColor	#02b202	▼
subMenusHoverBackgroundColor	#161616	▼
subMenusLinkHeight	33.00	
subMenusLinkWidth	150.00	
subMenusSeparatorBackgroundColor		...
subMenusSeparatorHeight	2.00	
subMenusSeparatorLineColor		...
subMenusSeparatorLineStartX	25.00	
subMenusSeparatorLineStartY	7.00	
subMenusSeparatorLineWidth	125.00	
subMenusSeparatorWidth	150.00	
subMenusThreshold	11	
subSubMenuLayout	30.0,80.0,360.0,360.0	...
subSubMenusThreshold	11	
subSubSubMenuLayout	30.0,80.0,360.0,360.0	...
topBarReference		
verticalBarColor	darkGray	▼
verticalBarWidth	2.00	
visible	true	▼

Figure 9 - Edit properties of a Pop-out Menu

Configuring the Pop-out menu, changing the configPath to the required XML file path and clicking OK completes the configuration of the Pop-out Menu. Save the Px page, by switching the mode from edit to view mode. Figure 10 provides a screenshot of the example Pop-out menu.

Example screenshot of a custom configured Pop-out Menu



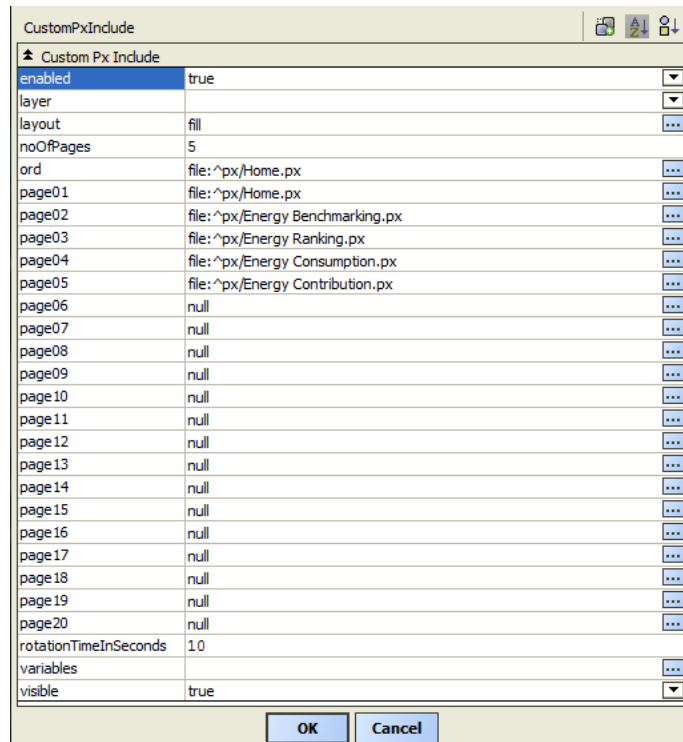
HOME	
ENERGY RANKING	
ENERGY BENCHMARKING	CAMPUS
ENERGY CONSUMPTION	LIBRARY
ENERGY CONTRIBUTION	SPORTS HALL
KIOSK MODE	TEACHING BLOCK

Figure 10 - Custom configured Pop-out Menu

5.3. Kiosk Mode

Kiosk mode is a mechanism to display a series of dashboard pages in a continually rotating sequence for use on a static display in a building reception or lobby area.

Kiosk mode is achieved using the EnergyVision Kiosk Mode custom PX panel. This is included in the energyVision palette.



The screenshot shows a dialog box titled "CustomPxInclude". It contains a table of properties for the "Custom Px Include" component. The properties are as follows:

Property	Value
enabled	true
layer	
layout	fill
noOfPages	5
ord	file:^px/Home.px
page01	file:^px/Home.px
page02	file:^px/Energy Benchmarking.px
page03	file:^px/Energy Ranking.px
page04	file:^px/Energy Consumption.px
page05	file:^px/Energy Contribution.px
page06	null
page07	null
page08	null
page09	null
page10	null
page11	null
page12	null
page13	null
page14	null
page15	null
page16	null
page17	null
page18	null
page19	null
page20	null
rotationTimeInSeconds	1.0
variables	
visible	true

At the bottom of the dialog box are "OK" and "Cancel" buttons.

Figure 11 - Edit Properties of the Kiosk mode CustomPxInclude

The Kiosk mode **CustomPxInclude** component can be added onto a PX page. The **page01-page20** properties allow the engineer to configure up to 20 pages to be displayed in a rotating sequence with a pause determined by the **rotationTimeInSeconds** property.

Navigating to the px page which contains the Kiosk mode CustomPXInclude component starts the rotation sequence.

N.B: It is often a good idea to provide a button or link on each of the sequence pages, to take the user to another page, and therefore exit kiosk mode if desired.

Kiosk Mode Properties

- **noOfPages:** The number of pages to be shown in the sequence. The sequence always starts at Page01, and cycles up the pages until the NoOfPages limit has been reached.
- **page01-Page20:** The ords for each PX file to be shown in sequence.
- **rotationTimeInSeconds:** The length of time to dwell on each page before showing the next page.

5.4. Meter Aggregator

The EnergyVision Meter Aggregator Component is a wiresheet component used to group a collection of meters for a particular zone, building, site etc. This is a core component of the EnergyVision system as it provides valuable data for graphical representation of energy consumption for a range of different periods using a single meter, or a group of sub meters.

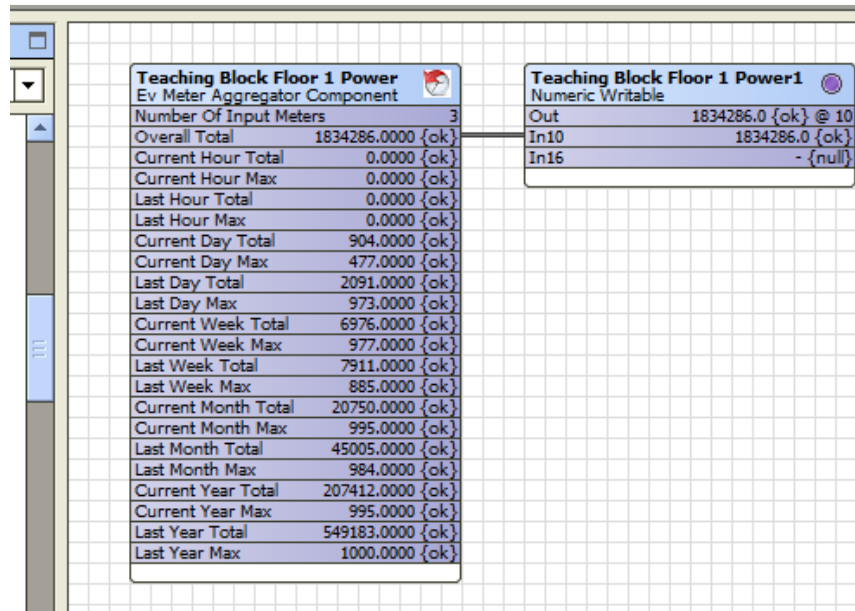


Figure 12 - Ev Meter Aggregator Component added on a Wiresheet

The component takes a number of Numeric Interval or Numeric COV (Change of Value) histories and aggregates these into a single component giving an overall Total of all values for all included histories, as well calculating totals, and max values for each of a range of specific time periods including:

- Overall Total
- Current Hour
- Last Hour
- Current Day
- Last Day
- Current Week
- Last Week
- Current Month
- Last Month
- Current Year
- Last Year

Features

- **“Load Totals” Action:** This action loads all the values by querying all available records for each Meter ord in the widget. This action should be called on adding/deleting meters as the values need to get updated accordingly. This action can be invoked sparingly to sync the values. Repeated use of this action will have an inverse effect on performance of the widget since all available history records are queried during this action.

- **“Add Meters” Action:** Allows the user to add up to a maximum of 50 meters of instantaneous/accumulative type. On adding the meters each meter needs to be specified a valid history ord, meter type and roll over value (Optional - in case of accumulative meters).
- **“Add Slots” Action:** This action allows the user to dynamically create Numeric Writable components corresponding to the status numeric slots for the widget. Also links the numeric components to its respective slots.

Meter Aggregator Properties

Ev Meter Aggregator Component (Ev Meter Aggregator Component)	
<input type="checkbox"/> Number Of Input Meters	0 [0 - 50]
<input type="checkbox"/> Polling Minutes	15
<input type="checkbox"/> Random Startup Delay	true
<input type="checkbox"/> Facets	units=null,precision=4,min=0.0000,max=999999999.0000 >>
<input type="checkbox"/> Last Update Time	null
<input type="checkbox"/> Overall Total	0.0000 {ok}
<input type="checkbox"/> Next Update Time	null
<input type="checkbox"/> Current Hour Total	0.0000 {ok}
<input type="checkbox"/> Current Hour Max	0.0000 {ok}
<input type="checkbox"/> Time Of Current Hour Max	null
<input type="checkbox"/> Last Hour Total	0.0000 {ok}
<input type="checkbox"/> Last Hour Max	0.0000 {ok}
<input type="checkbox"/> Time Of Last Hour Max	null
<input type="checkbox"/> Current Day Total	0.0000 {ok}
<input type="checkbox"/> Current Day Max	0.0000 {ok}
<input type="checkbox"/> Time Of Current Day Max	null
<input type="checkbox"/> Last Day Total	0.0000 {ok}

Figure 13 - Property sheet of Ev Meter Aggregator Component

- **Polling Minutes:** Determines the frequency with which the properties of the component are recalculated.
- **Number Of Input Meters:** Shows the number of meter histories which are combined in this particular Aggregator component.
- **Random Start-up Delay:** Schedules the component to calculate the totals with a random start up delay between 10s – 5minutes. This ensures that the station is not overloaded with processes if hundreds of such aggregator component is used in a single station.
- **Facets:** Units and precision of values can be setup or changed based on type of meters being aggregated by the component. Eg: kWh, m³ etc.
- **Last and Next Update Times:** Timestamps indicating last successful loading of totals and the next scheduled update timestamp.
- **Value Properties:** Various totals with corresponding max values within the respective time periods also providing the exact time stamp of the max consumption.

Using the Meter Aggregator

After adding the Meter Aggregator Component to a folder or wiresheet the user can enter the desired polling frequency (minutes). This schedules the component to recalculate totals and max values at the specific frequency.

Facets can be edited according to the user requirements.

Meters can be added to the aggregator using the add meters action, or deleted manually, or renamed as required. For each Meter in a Meter Aggregator component an Ev Meter component is created under the parent aggregator block.

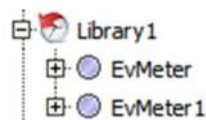


Figure 14 - Nav Pane view of Meter Aggregator with 2 meters added under it

Each Ev Meter component must be configured to include that particular Meter's History into the parent Meter Aggregator.

EvMeter Properties

EvMeter (Ev Meter)	
<input type="checkbox"/> Ord	history:/EnergyVision_Final/LibraryMeter1
<input type="checkbox"/> Status	{ok}
<input type="checkbox"/> Meter Type	Instantaneous
<input type="checkbox"/> Meter Effect	Additive
<input type="checkbox"/> Meter Roll Over Value	0.00

Figure 15 - Property sheet of individual meter components under the Ev Meter Aggregator

- **Ord:** Must be set the Numeric Interval/COV History for a Meter.
- **Meter Type:** Accumulative/Instantaneous. This determines whether the particular meter reading is a cumulative reading which continually increments, or an instantaneous value showing the consumption in the current period since the last reading.
- **Meter Effect:** Additive/Subtractive. This determines whether the meter increments over time, or decrements.
- **Meter Roll Over Value:** Meter Roll Over Value - Widget handles roll overs, provided correct roll over values for each meter is added. Default is 0.00 and if unchanged, would lead to loss of minor meter values.

Ex: If two histories are recorded as 980kWh and 55kWh for a meter. Meter roll over value should be suitably entered as 999kWh. If this value is entered incorrectly as 99kWh or 9999kWh or unchanged at 0.00, the higher recorded value is assumed to be the roll-over value and the record value is taken as 0.00 for any calculations.

Adding History Extensions and Alarms to the Meter Aggregators

Individual history extensions and alarms can be added on to Numeric components created underneath the component if required. The Add Slots action of the Meter Aggregator component creates child numeric writable object in the wiresheet of the Meter Aggregator component, linked to the slots of the Aggregator component itself. This allows alarms and histories to be added to these objects to enable events to be triggered based on consumption levels within a period, and to enable trend graphing of daily, weekly, monthly, and annual consumption levels.

5.5. Ranking Component and Ranking Graph

As the name suggests Ranking Component ranks a group of values. Ranking component works in tandem with the **Ev Meter Aggregator** component which provides the totals for a meter or group of meters. Ranking Component can be directly added from the EnergyVision palette onto a station's folder or wiresheet. Figure 16 shows the property sheet of a Ranking Component, each component can rank up to 10 **EvMeterAggregator** components, these aggregator components can be assigned to a ranking component by choosing the appropriate Ords in the properties. Ranking Component by default ranks the Overall Totals from the Meter Aggregator components in Descending order.

TeachingBlockMeterRanking (Ev Ranking Component)		
<input type="checkbox"/> History Component1 Ord	station: slot:/Energy\$20Ranking/TeachingMeter1Total	Folder icon
<input type="checkbox"/> History Component2 Ord	station: slot:/Energy\$20Ranking/TeachingMeter2Total	Folder icon
<input type="checkbox"/> History Component3 Ord	station: slot:/Energy\$20Ranking/TeachingMeter3Total	Folder icon
<input type="checkbox"/> History Component4 Ord	station: slot:/Energy\$20Ranking/TeachingMeter4Total	Folder icon
<input type="checkbox"/> History Component5 Ord	station: slot:/Energy\$20Ranking/TeachingMeter5Total	Folder icon
<input type="checkbox"/> History Component6 Ord	station: slot:/Energy\$20Ranking/TeachingMeter6Total	Folder icon
<input type="checkbox"/> History Component7 Ord	station: slot:/Energy\$20Ranking/TeachingMeter7Total	Folder icon
<input type="checkbox"/> History Component8 Ord	station: slot:/Energy\$20Ranking/TeachingMeter8Total	Folder icon
<input type="checkbox"/> History Component9 Ord	station: slot:/Energy\$20Ranking/TeachingMeter9Total	Folder icon
<input type="checkbox"/> History Component10 Ord	station: slot:/Energy\$20Ranking/TeachingMeter10Total	Folder icon

Figure 16 - Property sheet of a Ranking Component

A Ranking Graph can be added on the Px page by dragging the required Ranking Component from the nav pane of the station. Figure 17 shows the default Workbench View that has to be selected by default to display the Ranking Graph.

station:|slot:/Energy\$20Ranking/TeachingBlockMeterRanking

- Bound Label
- Include Px File
- From Palette
- Workbench View
- Properties
- Actions

- Ev Ranking View
- Property Sheet
- Wire Sheet
- Category Sheet
- Slot Sheet
- Link Sheet

Figure 17 - Adding the Ranking graph on a Px page

Once the Ranking Component has been added on the Px page and size of the ranking graph can be suitably changed to user requirements. The properties of the ranking graph can be changed according to

user requirements. Figure 18 shows an example screenshot of the edit properties of a Ranking graph while in edit mode of the Px page.

Properties of Ranking Graph

- **costConverter:** This works with the EnergyVision Cost Manager and selecting the appropriate unit will convert the consumptions to approx. costing. By default graph displays consumption.
- **displayMode:** This property specifies the quantity to be picked up from the Meter Aggregator component. By default the Overall Total is ranked from all the Meter Aggregator components. This can be changed to Current Hour Total, Current Week Total etc.

The screenshot shows the 'EvRankingView' dialog box with the following properties and values:

Property	Value
Ev Ranking View	
automaticLegendText	true
automaticScaling	true
automaticScalingDiffValue	10000.00
background	(default)
chartTitle	
colorScheme	Custom
costConverter	None
displayMode	Overall Total
enabled	true
fill01	(gradient)
fill02	(gradient)
fill03	(gradient)
fill04	(gradient)
fill05	(gradient)
fill06	(gradient)
fill07	(gradient)
fill08	(gradient)
fill09	(gradient)
fill10	(gradient)
foreground	white
graphBackground	(default)
gridLineColor	
layer	Column_1
layout	280.0,390.0,1040.0,280.0
legendText1	
loadDelayDivisor	10
loadDelayInMs	75
maxValue	650273.00
minValue	582010.00
popUpColor	white
popUpFont	(default)
popUpFontColor	black
popUpStroke	black
rankingOrder	true
showGridLines	false
showLegend	true
showValues1	true
textFont	(default)
visible	true
xAxisText	
yAxisText	kWh
Wb View Binding	
ord	station: [slot:/Energy\$20Ranking/TeachingBlockMeterRanking

Buttons: OK, Cancel

Figure 18 - Edit properties of Ranking View Graph

User Interaction

Hovering over each bar on the graph gives exact value as a pop-up tooltip. Clicking the mouse on the blocks of colour in the legend toggles hide and show values within the graph and remaining values are reordered and the graph is redrawn to new scale.

Example Screenshots of Ranking graphs

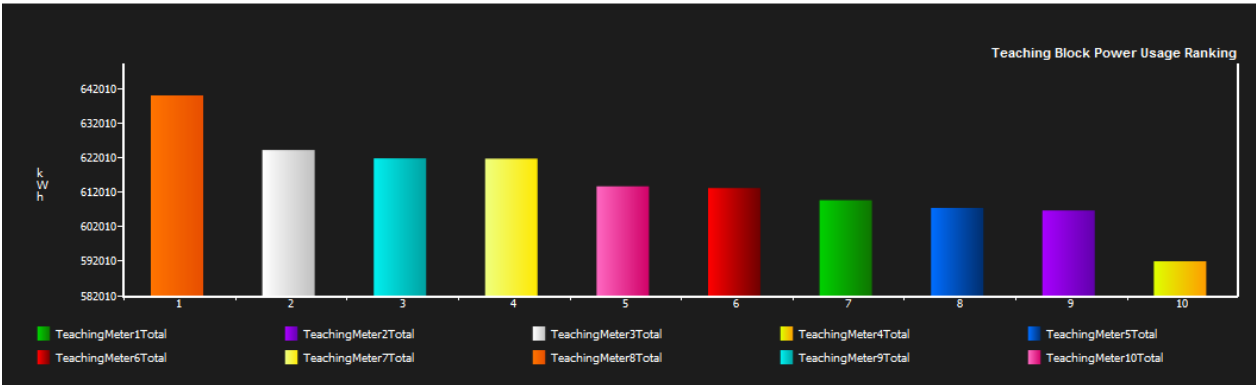


Figure 19 - Example screenshot of a single Ranking Graph

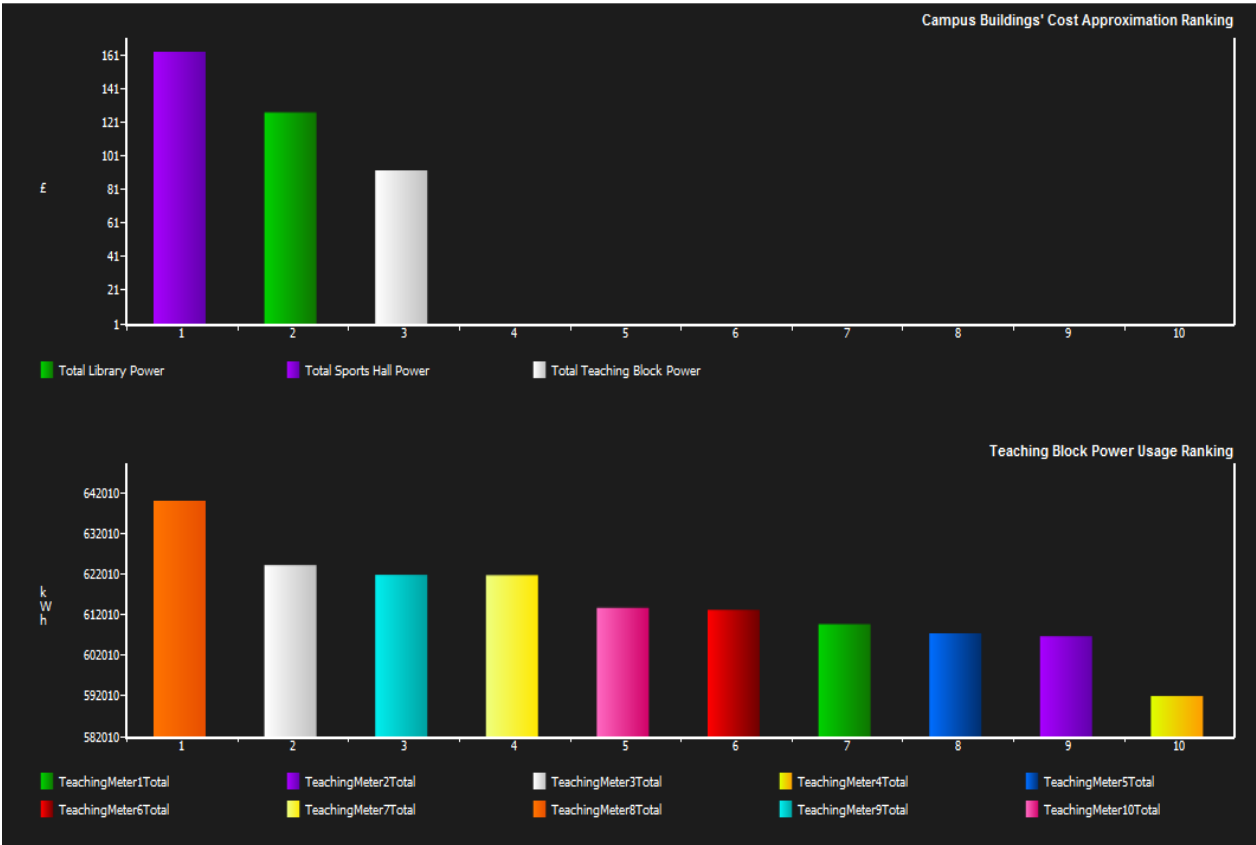


Figure 20 - Example Screenshot of Ranking graphs used to represent approx. costing and power usage

5.6. Benchmarking Chart

The Benchmarking charting component creates a Bar Graph which compares the daily values for either a weekly or monthly period, overlaying three different sets of bars, in three different colours representing daily values retrieved from within a standard Niagara AX numeric history. For a weekly period the three sets of bars represent daily totals for the current week, last week, and the same week last year.

For a monthly period the three sets of bars represent daily totals for the current month, last month, and this month last year.

In the case of a monthly benchmarking graph, the weekdays are aligned between this month, last month, and the same month last year, such that each of the 3 bars grouped together represent the same day of the week, this ensures that unfair comparisons between business and non-business days are never made (avoiding comparison of Sunday daily total with Monday for example). The number of values shown in a monthly benchmarking graph is always equal to the number of days in the current month. However the week-day alignment between the current and previous months means that the same day last month is actually the same weekday on or before the corresponding day in that previous month. Ex: The 12th of April 2013 (a Friday) would be grouped with the 8th of March 2013 (the nearest Friday before the 12th of March), and the 9th of March 2012 (the nearest Friday before the 12th of March 2012).

Features

The Benchmarking Chart consists of three elements:

1. **Numeric Interval History** – this can be created from any numeric interval history extension to a Numeric object such as a meter kWh reading logging at 24hr intervals.
2. **BenchmarkingComponent** created in the Station:
 - a. Drag a Benchmarking Component from the energyVision palette onto a folder or wiresheet.
 - b. View the property sheet of the Benchmarking Component to set its history Ord property to the appropriate Numeric Interval History Ord.
(The Load Delay In Ms, and Load Delay Divisor properties are used to configure the rate at which the bars of the graph rise from the X-Axis at the moment of page loading.)
3. **ChartingComponentView** of the BenchmarkingComponent created on a PX file:
 - a. Creates a Benchmark ChartingComponentView by dragging a Benchmark ChartingComponent onto a PX file which is open in the editor.
 - b. In the Make Widget Dialogue box click the Workbench View radio button, and select a ChartingComponentView.
 - c. Set the appropriate properties E.g. Charting Range:Weekly/Monthly, colorScheme, Y-Axis label, WeekFormatInDisplay: SundayToSaturday etc. and click Save to create the ChartingComponentView for the benchmarking bar graph.

User Interaction

Hovering over each bar on the graph gives exact value as a pop-up tooltip. Clicking the mouse on the blocks of colour in the legend toggles hide and show values within the graph and remaining values are redrawn to a new scale.

Charting Component Properties

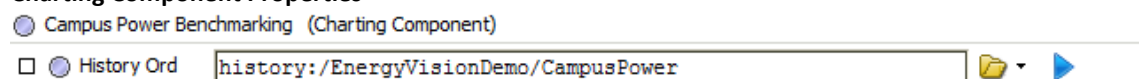


Figure 21 - Property sheet of a ChartingComponent

Charting Component View Properties

- **chartingRange:** Determines whether the chart shows a weekly or monthly chart.
- **colorScheme:** Determines whether the pie segments are coloured automatically using one of the preset colour schemes, or whether custom colours can be specified for each segment.

- **costConverter:** Determines whether chart shows a utility cost or raw consumption data.
- **weekFormatInDisplay:** Determines whether a weekly chart starts on a Sunday, or Monday.

ChartingComponentView	
Charting Component View	
automaticLegendText	true
automaticScaling	true
automaticScalingDiffValue	30.00
background	(default)
chartTitle	
chartingRange	Monthly
colorScheme	Custom
costConverter	None
enabled	true
fill1	(gradient)
fill2	(gradient)
fill3	(gradient)
foreground	white
graphBackground	(default)
gridLineColor	
layer	Column_1
layout	270.0,90.0,1053.0,190.0
legendText1	May, 2013
legendText2	April, 2013
legendText3	May, 2012
maxValue	1026.00
minValue	1.00
popUpColor	white
popUpFont	(default)
popUpFontColor	black
popUpStroke	black
showGridLines	false
showLegend	true
textFont	(default)
visible	true
weekFormatInDisplay	Sunday To Saturday
xAxisText	
yAxisText	kWh
Wb View Binding	
ord	station:/Energy\$20Benchmarking/Campus\$20Power\$20Benchmark
degradeBehavior	None

Figure 22 - Edit properties of Charting Component View

Figure 23 shows an example screenshot of a weekly benchmarking graph where a single bar representing the first day in the current period (shown in blue) is grouped closely with the first day in the previous period (shown in yellow), and the first day in the same period last year (shown in green).

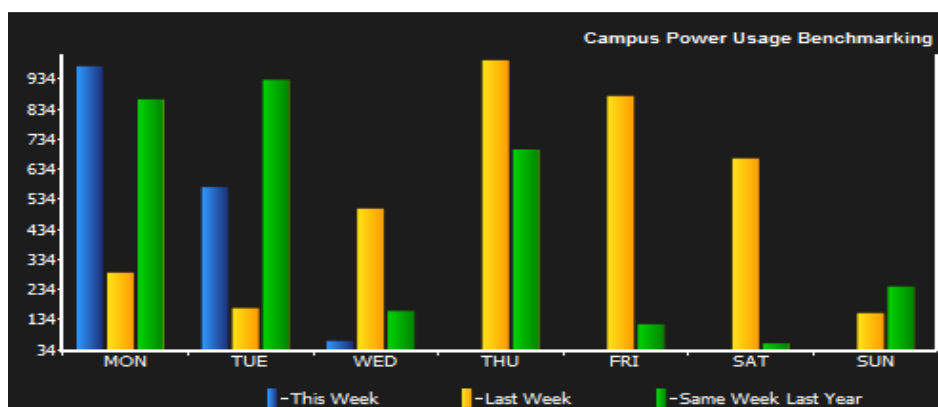


Figure 23 - Example Screenshot of a Weekly Benchmarking graph

5.7. Contribution Pie Charts

The EnergyVision contribution Pie Charts can be used to visualise the proportion of consumption that a particular building/floor/area contributes to the total consumption.

Pie charts can be used to show the contribution of different areas for a particular resource.

Ex: Proportion of water used by each building, or proportion of power consumed by each floor in an office block etc.

Contribution charts can be represented as either a traditional circular pie chart, or as a doughnut chart (ring shaped), with the option of displaying a legend below the chart.

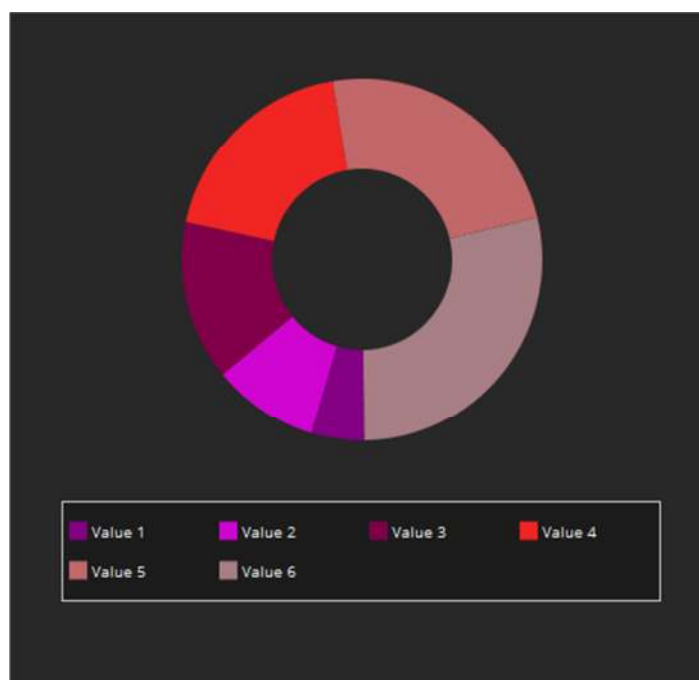


Figure 24 - Example Doughnut chart

User Interaction

Clicking the mouse on the blocks of colour in the legend either hide or show the segments relating to that segment on the chart.

Each segment of the pie chart has a tooltip which indicates the name of the segment, the value which the segment represents, and the percentage each segment contributes to the total. The tool tip is displayed when the mouse hovers over a segment. The border colour of the segment indicates which segment the tool tip refers to.

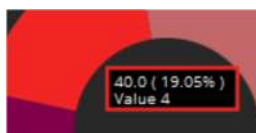


Figure 25 - Hover over tooltip on Doughnut or Pie Chart

Clicking the mouse pointer over a particular segment pops that segment out from the circle, or pops the segment back in again.

Holding down the mouse button and dragging the mouse spins the chart around in rotation.

Properties of a Pie Chart

PieChart	
↑ Pie Chart	
advancedMenu	false
colorScheme	Nature
costConversion	None
debugText	false
enabled	true
initialDelayMs	100
innerRadiusFac	0.30
layer	
layout	170.0, 10.0, 400.0, 490.0
legendBackGro	#4d000000
legendStroke	lightGrey
legendVisible	true
noOfBindings	Number Of Bindngs
noOfLegendcol	4
outerRadiusFac	0.60
popOutDist	15.00
popUpColor	black
popUpFont	(default)
popUpFontColc	#f7f7f7
sweepClockWis	true
sweepStartAng	0.00
textColor	white
textFont	(default)
value01	null
value02	null
value03	null
value04	null
value05	null
value06	null
visible	true

Figure 26 - Edit properties of a Pie Chart

The key properties used to configure the look and feel of the contribution charts are as follows:

- noOfBindings:** Change the number of bindings as per the number of segments desired. Once the noOfBindings property has been changed, click the refresh button to display the bindings which will automatically be created.

noOfBindings	Number Of Bindngs	...
noOfLegendcol	4	
outerRadi		
popOutDis		
popUpColc		
popUpFon		
popUpFon		
popUpStrc		
sweepCloc		

noOfBindings

☒ No Of Bindings (Number Of Bindngs)

☐ No Of Bindings [0 - 16]

OK Cancel

Figure 27 - Changing the No. of Bindings property

value01	station:/Home/Building\$201/Library\$20Gas\$20Consumption	...
value02	station:/Home/Building\$201/Sports\$20Hall\$20Gas\$20Consumption	...
value03	station:/Home/Building\$201/Teaching\$20Gas\$20Consumption	...
visible	true	▼
Pie Chart Value Binding		
ord	station:/Home/Building\$201/Library\$20Gas\$20Consumption	...
degradeBehavi	None	▼
hyperlink	null	...
summary	%displayName?typeDisplayName% = %. %	...
popupEnabled	true	▼
color	(gradient)	▼
ValueLabel		
boundToValue	1	
Pie Chart Value Binding		
ord	station:/Home/Building\$201/Sports\$20Hall\$20Gas\$20Consumption	...
degradeBehavi	None	▼
hyperlink	null	...
summary	%displayName?typeDisplayName% = %. %	...
popupEnabled	true	▼
color	(gradient)	▼
ValueLabel		
boundToValue	2	
Pie Chart Value Binding		
ord	station:/Home/Building\$201/Teaching\$20Gas\$20Consumption	...
degradeBehavi	None	▼
hyperlink	null	...
summary	%displayName?typeDisplayName% = %. %	...
popupEnabled	true	▼
color	(gradient)	▼
ValueLabel		
boundToValue	3	

Figure 28 - Editing properties on Value bindings

The name used in the tool tip, and legend can be automatically chosen based on the type of input which the value binding is bound to. For control points the control points name will be chosen, for properties the name of the property will be chosen. Alternatively the ValueLabel property in the Pie Chart Value Binding can be configured to override the automatic name selection.

- **legendVisible:** Determines whether a legend is displayed beneath the chart.
- **colorScheme:** Determines whether the pie segments are coloured automatically using one of the preset colour schemes, or whether custom colours can be specified for each segment.

colorScheme	Nature	▼
costConversion	Custom	
debugText	Nature	
enabled	Urban	
initialDelayMs	100	...
innerRadiusFactor	0.5	

Figure 29 - Changing colour schemes

- **initialDelayMs:** allows each pie chart to be loaded after a specific delay when the page is opened. This feature gives a visually appealing effect by staggering the loading of different pie charts on a single page.
- **startAngle:** Determines the angle on the circle to start the loading of segments when the page is opened.
- **noOfLegendColumns:** The number of legend columns (1 – 4), the number of rows will be calculated automatically.
- **sweepClockwise:** Load animation can be clockwise or in anti-clock wise.
- **costConversion:** Converts the displayed values using the cost per unit taken from the energy vision cost manager.

5.8. Consumption Dials/Gauges

The EnergyVision palette includes a number of dials and gauges used to show current consumption values for single meters, areas, buildings etc. The different dials are styled to suit a variety of applications.

Each type of dials have specific properties, however the key properties for all dials are detailed below.

Key Properties

- **Min Value:** minimum value in the range
- **Max Value:** maximum value in the range
- **Input Value:** bound to a point by default
- **Medium per cent:** input values greater than this % of the range between min and max values are considered as medium range values. This medium range is shown as a yellow segment in the gauge
- **High per cent:** input values greater than this % of the range between min and max values are considered as High range values. This high range is shown as a red segment in the gauge.
- **advancedMenu:** This properties determines whether advanced properties relating to start and stop angles of dials are shown or hidden from the properties sheet.

5.8.1. Bar Gauge

The bar gauge is used to show a horizontal bar similar to a progress bar. This can be useful for showing a level of consumption for one particular period. E.g: CO2 consumption for last week.

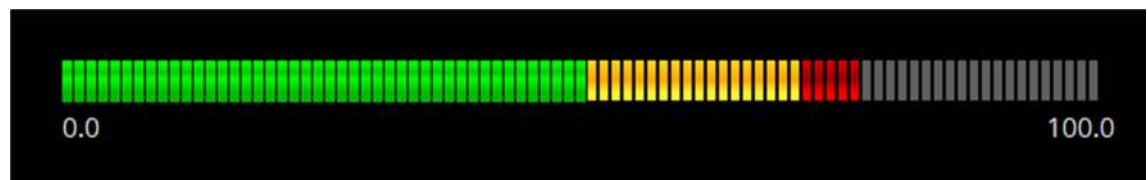


Figure 30 - Screenshot of an example Bar Gauge

Bar Gauge Properties

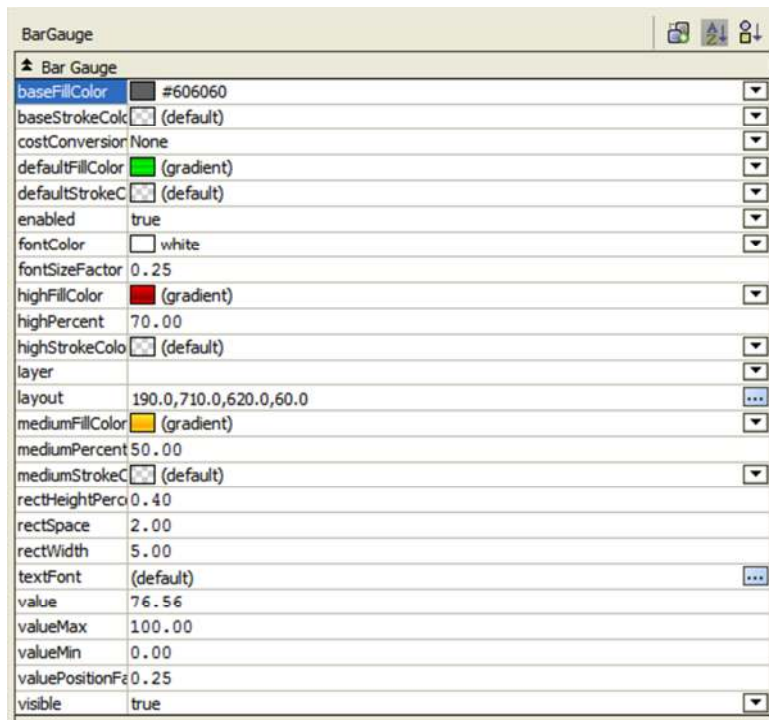


Figure 31 - Edit properties

5.8.2. Compass

The compass dial is used to show a compass bearing/direction and is useful for displaying wind direction when using a weather station or weather service to obtain the current prevailing wind direction.

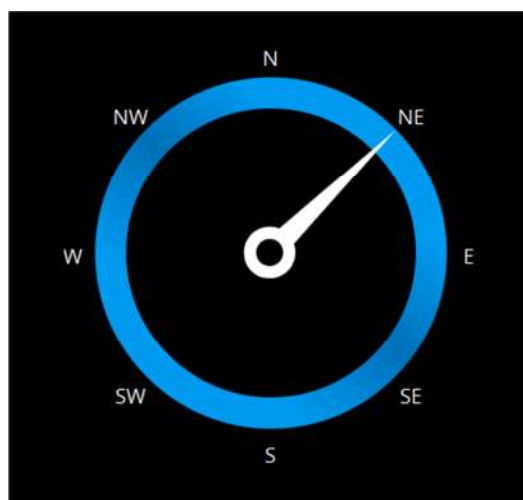


Figure 32 - Example screenshot of a Needle Compass

Compass Properties

Compass	
bezelBaseFill	(gradient)
bezelShader0	(default)
directionText	true
directions	Direction
enabled	true
layer	
layout	20.0,650.0,140.0,130.0
needleFill	white
needleGeom	M20.837,-10.302 C17.274,-18.542 9.13,-24.38 -0.399,-24.492 l0.0,0.0 c-8.455,-0
needleRadiusF	0.85
scaleTextFill	white
scaleTextFont	(default)
scaleTextRadius	0.96
scaleTextVisible	true
sweepArcAngle	360
sweepClockwise	true
sweepStartAng	270
tickMajorDivisio	10
ticksVisible	true
unitRadiusPosit	0.30
unitText	
value	45.00
valueMax	360.00
valueMin	0.00
valueRadiusPos	1.50
visible	true

Figure 33 - Edit properties of a Compass

5.8.3. Deviation Needle Dial

The Deviation Needle Dial is used to represent the size of deviation away from a desired set point.

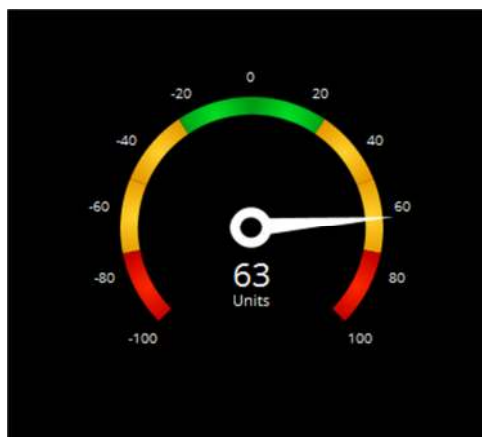


Figure 34 - Example Screenshot of a Needle Dial

Deviation Needle Dial Properties

DeviationNeedleDial	
Deviation Needle Dial	
advancedMenu	false
costConversion	None
dialColor	green
dialStroke	black
enabled	true
innerRadiusFac	0.52
layer	
layout	40.0,300.0,320.0,320.0
needleFill	white
needleRadiusFac	0.65
outerRadiusFac	0.60
segCol1	(gradient)
segCol2	(gradient)
segCol3	(gradient)
segCol4	(gradient)
segCol5	(gradient)
segCol6	(gradient)
segCol7	(gradient)
segCol8	(gradient)
segmentCount	8.00
sweepClockWise	true
sweepEndAngle	45.00
sweepStartAngle	135.00
tickFontSizeFac	0.11
tickMajorDivision	10
tickTextColor	white
tickTextFont	(default)
tickTextRadiusFac	1.17
tickTextVisible	true
unitText	Units
unitTextColor	white
unitTextXPos	0.00
unitTextYPos	0.55
value	station: /slot:/NumericWritable
valueMax	100.00
valueMin	-100.00
valueTextColor	white
valueTextVisible	true
valueTextXPos	0.00
valueTextYPos	0.35
visible	true

Figure 35 - Edit properties of a Needle Dial

- **unitText:** the text label to display the units of measurement

5.8.4. LED Dial

The LED Dial is used to represent a current analog value such as total Power consumed this week (kWh). The current value is displayed graphically as a ring of LEDs as well as a textual value label with the units shown beneath. Above textual value a text label can be used to give an explanation of what analogue input this dial represents.

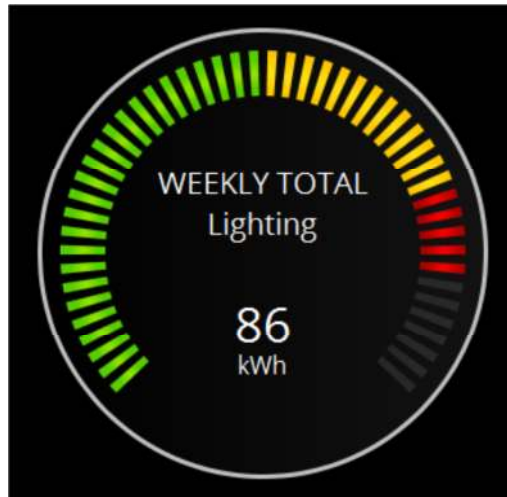


Figure 36 - Example screenshot of a LED Dial

LED Dial Properties

LedDial	
Led Dial	
advancedMenu	false
baseColor	(gradient)
bezelColor	(gradient)
bezelFactor	0.98
costConversion	None
enabled	true
fontColor	white
innerRadiusFac	0.70
layer	
layout	420.0,230.0,380.0,300.0
ledBaseColor	#80424242
ledBaseStroke	(default)
ledDefaultColor	(gradient)
ledDefaultStroke	(default)
ledHiBandColor	(gradient)
ledHiBandStroke	(default)
ledMediumBandColor	(gradient)
ledMediumBandStroke	(default)
outerRadiusFac	0.90
scaleHighPerce	75.00
scaleMedPerce	50.00
segmentCount	50.00
sweepClockWis	true
sweepEndAngl	45.00
sweepStartAng	135.00
text1	WEEKLY TOTAL
text1FontSizeF	0.15
text1RadiusPos	-0.35
text1Visible	true
text2	Lighting
text2FontSizeF	0.15
text2RadiusPos	-0.15
text2Visible	true
textFont	(default)
unitFontSizeFa	0.12
unitRadiusPosi	0.55

Figure 37 - Edit properties tab for LED Dial

- **text1:** the first line of text label to be shown in the centre of the dial
- **text2:** the second line of text label to be shown in the centre of the dial
- **unitText:** the text label to display the units of measurement
- **unitVisible:** determines whether the units are shown

5.8.5. Needle Gauge

The Needle gauge is used to represent a current analogue value such as current power, gas, water consumption etc. The palette contains needle gauges in 4 commonly used colours for representing utility consumption.



Figure 38 - Example screenshots of Needle Gauges with varying templates

Needle Gauge Properties

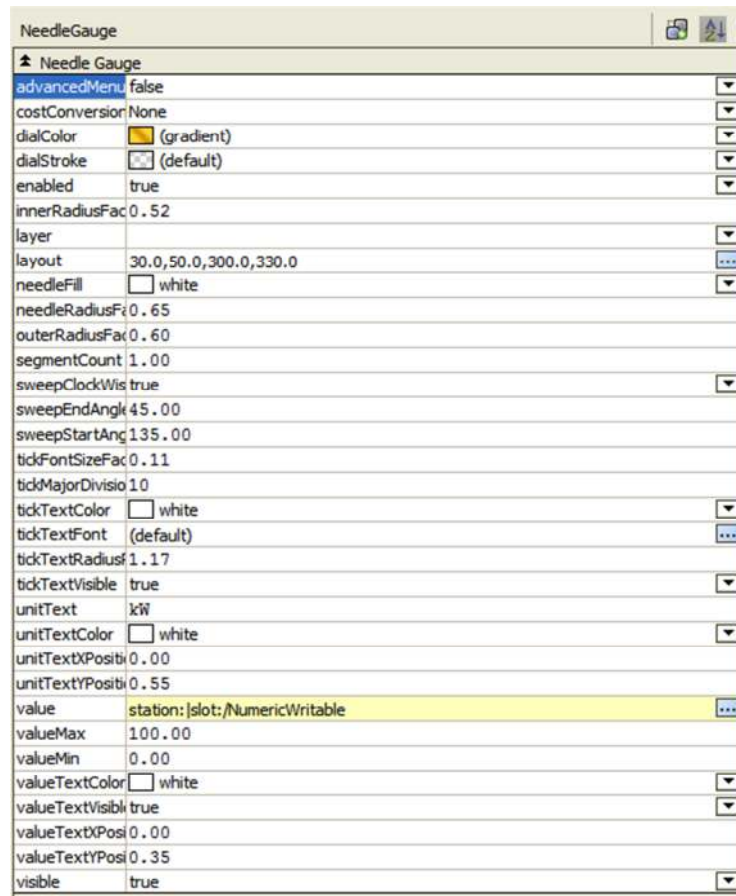


Figure 39 - Edit properties of a Needle Gauge

- **sweepClockWise:** determines whether the lowest value needle position is at the bottom left or bottom right of the gauge.

5.8.6. Segments Dial

The Segments Dial provides an alternative representation of an analogue dial which includes optional icons for power and temperature. The colour of these icons changes in accordance with the colour band that the current value falls within.



Figure 40 - Example screenshots of Segments Dials displaying values for Temperature and Power

Segments Dial Properties

Segments Dial	
MaxValue	100.00
MinValue	0.00
baseColor	Brush Pack
bezelColor	Brush Pack
bezelThickness	5.00
bgSegmentColo	(gradient)
bgSegmentStrc	#4d000000
clockWise	true
costConversion	None
enabled	true
endAngle	45.00
innerCircle1Col	Brush Pack
innerCircle2Col	Brush Pack
innerRing0Sdai	0.20
innerRing1Sdai	0.22
layer	
layout	410.0,210.0,310.0,350.0
logoGeom	M0.0,0.0 L7.639,0.0 2.492,-9.113 7.639,-9.113 -5.999,-23.15 -0.521,-12.15 -€
logoPositioning	113.00
logoRadiusPosi	0.53
logoSizeFactor	10.00
meterType	Power
noOSegments	18.00
segmentColor	(gradient)
segmentDefaul	(gradient)
segmentDefaul	(default)
segmentGradi	(default)
segmentHiColor	(gradient)
segmentHiStro	(default)
segmentHighPe	75.00
segmentMedCc	(gradient)
segmentMedPe	50.00
segmentMedSt	(default)
segmentStroke	(default)
startAngle	135.00
textFont	(default)

Figure 41 - Edit properties of Segments Dial

- **meterType:** this determines whether an icon is displayed at the bottom of the gauge to represent the type of utility being measured second line of text label to be shown in the centre of the dial
- **unitText:** the text label to display the units of measurement
- **unitVisible:** determines whether the units are shown

5.9. Example Pages

Home Page



Figure 42 - Example Home Page

Energy Ranking

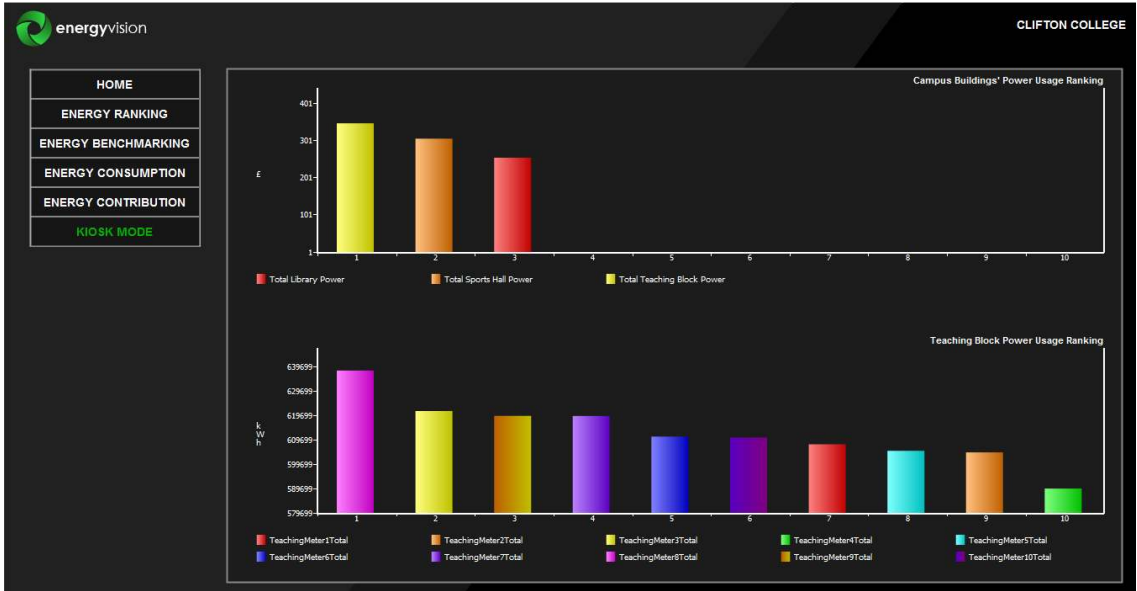


Figure 43 - Example Ranking Page

Energy Benchmarking



Figure 44 - Example Benchmarking Page

Energy Consumption



Figure 45 - Example Energy Consumption page showcasing various types of dials

Energy Contribution

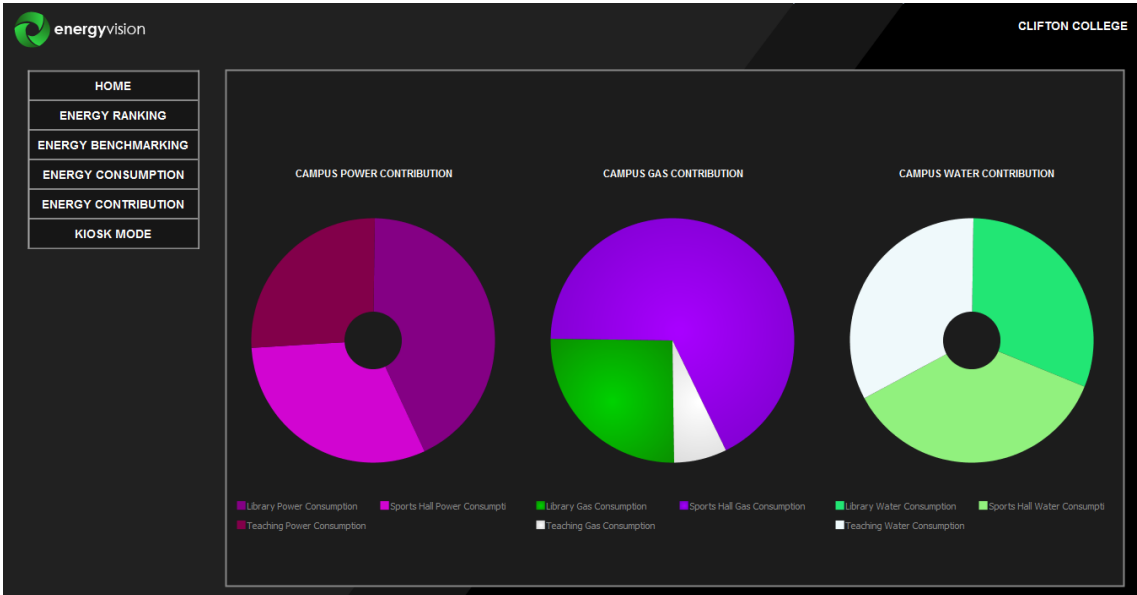


Figure 46 - Example Energy Contribution page using various types of Pie Charts

6. EnergyVision Demo Station

The EnergyVisionDemo station includes a fully configured dashboard and energy benchmarking system, representing a school campus. The demo station includes randomly created history data for a collection of gas, water, and power meters, including meter aggregation components, ranking components, dials, charts, etc.

The EnergyVision Demo station has the following configured users:

Username: admin

Password: admin123

Rights: Super-user

Username: demo

Password: energyvision123

Rights: read only rights including the ability to access the web graphics, override/set points etc.

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